Erosion and Sediment Control Plan – Peka Peka to Ōtaki Project

FCCL-EV-MPN-0007

Final C – September 2017

Contents

AUTHORISATION AND REVISION RECORD

Revision	Status	Author	Date	Description
A	Draft	Graeme Ridley	1/2/17	First draft (for PA Review)
B	Draft	Graeme Ridley	3/3/17	Second Draft (for PA review)
B.1	Draft	Graeme Ridley	15/3/17	Third Draft (for council review)
B.2	Draft	Alice Naylor	25/5/17	For Council review
B.3	Draft	Alice Naylor	31/07/17	For Council review
B.4	Final Draft	Alice Naylor	7/9/17	For Council review
C	Final	Alice Naylor	14/9/17	For Council Approval

CERTIFICATION RECORD

Revision	Action	Name	Position	Date	Signature
	Reviewed by:				
	Approved by:	Richard Percy	Project Leader	18/9/17	
	On behalf on GWRC				

CONDITIONS - REFERENCE GUIDE

Note: For full condition wording please refer to conditions from Board of Inquiry (BoI) decision.

The following table is provided to assist with assessing compliance with Consent Conditions. It is our intention this guide be removed before this Management Plan is lodged for certification with council.

Condition No.	Condition Summary / Requirements	ESCP Section
E1 (a)	The consent holder shall submit an ESCP to the Manager for certification at least 20 Working Days prior to Commencement of Construction in accordance with Condition G.19.	1
E1 (b)	The purpose of the ESCP is to describe the methods and practices to be implemented to minimise the effects of sediment generation and yield on the aquatic receiving environments associated with the Project.	1
E.1 (b) (i)	The ESCP shall outline the BPO principles to which the ESCP shall adhere	Full ESCP / 2.2
E.1 (b) (ii)	The ESCP shall be developed in accordance with the objectives outlined in the NZTA's Environmental Plan	1
E.1 (b) (iii)	The ESCP shall ensure construction and maintenance activities avoid, remedy or mitigate effects of soil erosion, sediment run-off and sediment deposition	Full ESCP
E.1 (b) (iv)	The ESCP shall identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas, including the northern dunescape, Ōtaki River, and the Railway Wetland area	2 / 3/ 4
E.1 (b) (v)	The ESCP shall identify an adaptive monitoring and management regime	6
E.1 (b) (vi)	The ESCP shall Use bio-engineering and low-impact design practices where practicable	3
E.1 (c)	The ESCP shall be prepared by a suitably qualified specialist and finalised in consultation with Nga Hapū o Ōtaki. Work shall not commence until the	1 / Full ESCP

Condition No.	Condition Summary / Requirements	ESCP Section
	consent holder has received the Manager's written certification for the ESCP.	
E.3	The consent holder shall carry out monitoring and management in accordance with the ESCP and the SSEMP, and shall ensure that: a) The proposed erosion and sediment control measures have been installed in accordance with the ESCP and SSEMP and industry best practice; b) Management is carried out in accordance with best practice; c) Erosion and sediment control measures are functioning in accordance with the ESCP and SSEMP throughout the duration of the construction of the Project; and The sediment discharge implications of any impeded drainage to ground, such as by deposition of fine sand, are a particular focus of site control monitoring, with appropriate remedial action taken as required.	6
E.4 (a)	In the event of either a failure of erosion and sediment control devices or where a storm event exceeds the design volume of the device, and where the discharge is to a perennial or intermittent fresh Water Body, a suitably qualified ecologist shall be notified within 24 hours, who shall then inspect the relevant area to determine whether there has been a significant adverse effect on the affected area's ecological values	6
E.4 (b)	The consent holder shall prepare a report on the effects of the failure and any recommended measures	6

Condition No.	Condition Summary / Requirements	ESCP Section
E.4 (c)	The consent holder shall ensure that after reasonable mixing no further serious impacts shall occur within the receiving environment	6
E.4 (d)	The remedial measures shall be implemented within 10 Working Days of the approval of the Manager	6
E.5	Undertake inspections, at a minimum frequency of weekly, of all working areas of the site in order to ensure they are well maintained and that erosion and sediment control devices remain effective.	6.2
E.6	Prior to earthworks commencing a certificate signed by an appropriately qualified and experienced sediment control practitioner to certify that the erosion and sediment control measures have been constructed.	3.5.2
E.7	A copy of the "as-built(s)" and the certified SSEMPs shall be kept on site and all erosion and sediment control measures updated as soon as practicable.	3.5.2
E.8	No erosion and sediment control measures shall be removed or decommissioned from a site, or Stage before the entire area is stabilised, unless such removal and decommissioning is in accordance with the CEMP or a SSEMP, and the Manager has been informed.	3.5.2
E.9	Chemical treatment shall be used to improve the treatment efficiencies of all sediment retention ponds unless it can be demonstrated through bench testing that chemical treatment will not provide any	6.4

Condition No.	Condition Summary / Requirements	ESCP Section
	benefit. Detail of this shall be included in the relevant SSEMP.	
WS.2	All construction Works authorised by this consent undertaken in the dry bed of the stream as far as practicable, and are completed before the flow of the stream is diverted into that portion of the stream bed.	4.5
G.41	The consent holder shall undertake the following monitoring during construction (in accordance with the methods, locations, frequency, reporting and all operation and maintenance procedures as outlined in the EMP): a) During the construction phase sediment effects are managed using the ESCP turbidity inspection/response process as outlined in the flowchart in Annexure 1. This management process involves: i Setting the rainfall triggers for turbidity monitoring as set out in the ESCP; ii Turbidity monitoring occuring upstream and downstream of the construction site on waterways at which construction is underway when the rainfall trigger has been exceeded; iii Turbidity monitoring, as set out in the EMP, occuring at the time the rainfall trigger is exceeded and be repeated 24 and 48 hours after that exceedance; and iv Ecological investigations where there is a gross exceedance triggered and/or as informed by the results of the repeated turbidity monitoring.	6.3
G.42	The construction turbidity monitoring set out in condition [G.41(a)] shall use the turbidity triggers set in the EMP (using the process set out in the	6.3

Condition No.	Condition Summary / Requirements	ESCP Section
	EMP and condition [G.39]). During construction, until the relevant earthwork area discharging to the monitored waterways are stabilised, should the gross exceedance trigger be exceeded in any of the three required monitoring events following an exceedance of the rainfall trigger, or the elevated level trigger be exceeded at the 48 hour monitoring, the following responses shall be implemented by the consent holder.	

1 PURPOSE OF ESCP

The purpose of this Erosion and Sediment Control Plan (ESCP) is to fulfil the requirements of condition E.1 of resource consent associated with the Peka Peka to Otaki Project (the "Project"). Specific project details have been outlined in Section 1 of the Construction Environmental Management Plan (CEMP). Condition E.1 requires submission of the ESCP to the Greater Wellington Regional Council (GWRC) Manager for certification at least 20 Working Days prior to commencement of construction. The ESCP will form part of the overall Construction Environmental Management Plan (CEMP) as per Condition G.19 of consent.

As per Consent Condition G.21 any amendments to this ESCP can be certified by submitting the amendments in writing to GWRC for certification at least 10 Working Days prior to any changes taking effect. Any changes to the ESCP shall remain consistent with the overall intent of the management plan and relevant conditions and achieve the outcomes required by the conditions.

The purpose of this ESCP is to describe the methods and practices to be implemented to minimise the effects of sediment generation and yield on the aquatic receiving environments associated with the Project. This ESCP is prepared to provide guidance to the overall Project team however it is important that the Site Specific Environmental Management Plans (SSEMPs) are recognised as the key document that the Project will use for construction purposes. Further this ESCP, while focusing on erosion and sediment control (ESC), also provides environmental guidance on a number of other activities associated with the Project including but not limited to use of concrete. Information and recommendations from the NZTA Environmental Plan have been taken into consideration during development of this ESCP.

1.1 Consent Conditions

This ESCP is designed to provide the necessary detail to fulfil consent condition E.1. The further and more detailed assessment will be provided within SSEMPs as required through conditions G.28 – G.30. Reference should be made to the specific conditions of consent, and the consent condition checklist provided in this ESCP, however for ease of reference Condition E.1 states:

a) *The consent holder shall submit an ESCP to the Manager for certification at least 20 Working Days prior to Commencement of Construction in accordance with Condition G.19.*

b) *The purpose of the ESCP is to describe the methods and practices to be implemented to minimise the effects of sediment generation and yield on the aquatic receiving environments associated with the Project. In addition, the ESCP shall:*

   i. *Outline the BPO principles to which the ESCP shall adhere;*

   ii. *Be developed in accordance with the objectives outlined in the NZTA's Environmental Plan;*

   iii. *Ensure construction and maintenance activities avoid, remedy or mitigate effects of soil erosion, sediment run-off and sediment deposition;*

   iv. *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas, including the northern dunescape, Ōtaki River, and the Railway Wetland area;*

   v. *Identify an adaptive monitoring and management regime; and*

   vi. *Use bio-engineering and low-impact design practices where practicable.*

c) *The ESCP shall be prepared by a suitably qualified specialist and finalised in consultation with Nga Hapū o Ōtaki. Work shall not commence until the consent holder has received the Manager's written certification for the ESCP.*

2 SITE DESCRIPTION AND EROSION AND SEDIMENT CONTROL PRINCIPLES

2.1 Site Description

The following section outlines a generic site description to provide context for the development of this ESCP and selection of ESC measures.

The site generally has peat soils overlaying sand layers in addition to areas of sand dominant soils and alluvial soils. It is important to recognise that characteristics such as the high water table in peat soils or typically high infiltration rates in sand dominant soils and alluvial material can dictate the type of ESCs utilised. It is important that ongoing monitoring of this infiltration capacity occur to allow for areas of compaction (as a result of construction activities) and ensure that if infiltration is reduced that any resultant runoff is treated with appropriate erosion and sediment controls accordingly.

The slopes along the Project are considered very “gentle” and do not represent a significant issue from an erosion perspective. The peat soils contain a relatively high proportion of clay and silt particles and therefore once in suspension can take long periods to settle out. With respect to the sand and alluvial soils however, while they can erode easily, due to their larger particle size, they settle within the water column relatively quickly.

The receiving environment values associated with the site include a range of both fresh water and coastal ecological and amenity values. It is important that ESC options recognise these values and manage the discharge of sediment accordingly.

Sediment generally arises from the bulk earthworks phase of operations because of the area exposed by these works and the time required to undertake the works. For this Project, bulk earthworks will be undertaken and accordingly the soil types and the construction methodology are both considered of significant influence.

In addition to sediment control measures alone, a reduction in erosion on site will result in far less sediment being generated and subsequently treated and discharged from the control measures.

The following ESC principles will apply and be used to inform the specific methodologies and techniques specified within the project SSEMPs.

2.2 ESC Design Principles

ESC will be undertaken and implemented as follows:

- Avoidance of effects as a first priority. Any discharge locations will be carefully selected and any disturbance will only be undertaken where they are a necessary component of the project construction.
- Erosion control will be a priority in all circumstances by preventing sediment generation through a range of structural (physical measures) and non-structural (methodologies and construction sequencing) means. Progressive stabilisation using temporary and permanent measures will be a

fundamental part of erosion control across the project. Specific erosion control measures are described below in section 3.4.

- ESC measures will primarily be based on the Greater Wellington Regional Council (September 2002, reprinted 2006) Erosion and Sediment Control Guidelines for the Wellington Region (GWRC Guidelines). However, due to the site conditions and soil types with generally high infiltration rates, not all ESC measures outlined within the guidelines will be appropriate. Specific methodologies and device location and design are based upon the appropriate approval of site specific ESC plans outlined in the relevant SSEMP.

- Viewing the proposed Project works such that all construction activities, and the full effects of these construction activities, are considered as a package. Implementation of an integrated approach for design, implementation, maintenance and disestablishment of ESC measures will be important.

- SSEMPs will allow for future innovation, flexibility and practicality of approach to ESC and in doing this will ensure that the project continues to adapt appropriately to changing conditions. Changing site conditions depending on the phase of works will require forward planning and the ability to recognise the need for a change to ESC based on works progression.

- During construction activity, where it is considered to be the only option that ESC devices are required within flood prone areas, the placement of ESCs will be undertaken with consideration of minimising catchment areas and ensuring more regular maintenance activities. Where SSEMPs are noted to include work within the flood plain (typically information is only available for the 5% AEP for higher risk waterbodies) this will require consideration of any flood impacts and additional maintenance of inundation which will be reflected in the SSEMP information.

- Specific discharge water quality standards are not proposed; however, the discharge from the Project is designed to avoid conspicuous change in the colour or visual clarity of the discharge (after reasonable mixing) in the receiving environment. Condition G.39 provides specific monitoring and ecological trigger thresholds which form part of an adaptive monitoring regime.

3 PROJECT APPROACH TO ESC

The following outlines the ESC approach that will be adopted for the project and builds on the principles outlined in section 2 above. Additional aspects may be outlined within the SSEMPs which will incorporate further detail based on specific design input construction input. The aim of this ESCP is to demonstrate that negligible sediment-related effects will result from construction activities with appropriate measures put in place and also providing guidance for SSEMP development.

3.1 Erosion Control

- Cleanwater diversion channels / bunds will be established above the works location to ensure that minimal cleanwater can enter the site of works. The contours of the existing landform are such that these cleanwater diversions are effectively doubling as perimeter bunds however will be stabilised on external faces to ensure no erosion results. The SSEMPs will specify the location

of the cleanwater diversion channels, designed to cater for the 5% AEP rainfall. Cleanwater runoff diversion channels design will be based on the tables and summary of calculations provided within Appendix A of this ESCP.

- Progressive and rapid stabilisation of disturbed areas utilising topsoil (where necessary) and seed, polymers mulch and geotextiles will be ongoing throughout the Project. Mulch will include hay/straw and wood which will often be generated on site through the removal and mulching of existing vegetation as necessary. Stabilisation will apply particularly with respect to stockpiles and batter establishment. Stabilisation is designed for both erosion control and dust minimization.
- Flumes will be utilised in accordance with the GWRC Guidelines to safely transfer runoff from the top of batters to the bottom of the batter slopes and to ensure no scour of these batters occurs.
- Additional scour protection may be utilised in areas with steep slopes or runoff diversion channels.

3.2 Sediment Control

- Sediment control devices will be installed in accordance with the criteria outlined in section 3.4 below. It is anticipated that, due to soil types, activity type and site conditions, the primary controls used on site will often be dirty water diversion channels / bunds which will act as an infiltration devices due to the generally high infiltration rates of the sand and alluvial soils. Dirty water runoff diversion bund design will be based on the tables and calculations provided within Appendix B of this ESCP.
- In areas where infiltration is not an appropriate form of treatment, conventional measures will be implemented in accordance with the criteria in Section 4 below and the GWRC Guidelines. Specific details will be outlined within each of the SSEMPs with ESC measures designed specifically to suit the relevant site conditions.
- Pumping of sediment laden runoff and groundwater during construction will be required at numerous periods during excavation works. At all times the Project will follow the 'Permit to Pump' process as outlined in Appendix C (Permit to Pump System) of this ESCP. This is based on a standard audit process that ensures any dewatering and/or pumping is undertaken in accordance with appropriate procedures and environmental consideration.
- Where practicalities allow, the project team may utilise permanent stormwater treatment devices to assist with the management of runoff from the Project. Where the permanent features are utilised, consideration will be given to pond depth and configuration to ensure that the eventual conversion of these to long term stormwater features can be undertaken appropriately. No existing natural wetlands will be used for primary treatment of construction related sediment discharge.
- Any floating decants used on site will be fitted with a mechanism to control (or cease) outflow. This mechanism could take the form of a manual decant pulley system or plug.
- Stabilised entrance ways will be established at ingress and egress points of the site that interface with local roads. No vehicles will leave the site unless tyres are clean and will not contribute excessive sediment onto road surfaces. Wheel wash facilities will be established only if necessary.

3.3 Non-structural Measures

- Regular inspections and maintenance of ESC devices will take place to ensure that issues are proactively identified and remedied promptly. Further information on routine and triggered monitoring is outlined in section 6 below.
- Identification of 'high-risk' areas i.e. sensitive receiving environment or flood-prone areas. Additional inspections may be required as well as additional considerations such as, but not limited to, reducing open areas, more regular maintenance, and condensing the works programme.
- Weather forecasting and associated responses (outlined further in Section 6)
- Forward planning and adapting to different stages of the works programme to ensure that ESC is appropriate for the site conditions.

3.4 Summary of ESC Design Criteria

The follow table provides a guide to the design criteria that will generally be applied in regards to specific ESC devices and methodologies to be employed. These will all be confirmed through the development of SSEMPs which require certification as per Conditions DC.23 and G.28 prior to construction commencing in a given location.

Table 1: ESC Device Criteria

ESC Device / Methodology	Criteria
Cleanwater Diversions	SSEMPs will specify cleanwater diversion channels, designed to cater for the 5% AEP rainfall event. These will be constructed in accordance with the calculations specified in Appendix A.
Dirty Water Diversions	SSEMPs will specify dirty water runoff diversion channels which will be sized to cater for the 5% AEP rainfall event. These will be constructed in accordance with the calculations specified in Appendix B.
Stabilisation for erosion and dust management purposes	Progressive and rapid stabilisation of disturbed areas utilising topsoil (where necessary) and seed, mulch and geotextiles will be ongoing throughout the Project. Polymer will also be utilised within sand soil locations for surface erosion and dust protection.
Flumes	Flumes will be utilised in accordance with the GWRC Guidelines to safely transfer runoff from the top of batters to the bottom of the batter slopes.
Stabilised entrance ways	Stabilised entrance ways will be established at ingress and egress points of the site where appropriate.

ESC Device / Methodology	Criteria
Sediment Retention Ponds	Although unlikely given the site conditions, if SRPs are used these will be constructed in accordance with GWRC Guidelines.
Pumping Activities	Pumping of sediment laden runoff and groundwater during construction will require an approved permit to pump signed off by the environmental team prior to each pumping activity.
Decanting Earth Bunds	All DEBs established will be based on a volume of 2% of the contributing catchment area and will be constructed in accordance with GWRC Guidelines.
Decant Systems	Floating decants will be fitted with a mechanism to control (or cease) outflow when required. Decants may also be utilised in diversion bunds or stormwater swales.
Silt Fences	All silt fences will be based upon design criteria outlined in the GWRC Guidelines.
Super Silt Fences	All super silt fences will be based upon the design criteria within GWRC Guidelines. Super silt fences will typically be utilised in close proximity to streams and areas identified as high risk in the SSEMPs.

3.5 Specific ESC Documentation Requirements

3.5.1 Minor Changes

As per Condition G.21A minor changes to SSEMPs shall be submitted to the Manager in writing at least 2 Working Days prior to the work commencing.

Minor changes are considered changes to ESC that will not materially change the manner in which the works will be undertaken, or the way in which the outcomes sought by the consent are achieved. These include, but may not be limited to:

- Repositioning or implementing silt fences or super silt fences;
- Installation of diversion bunds, check dams and inlet protection;
- Stabilisation
- Changing the dimensions of a device where the ESCP objectives remain as previously.

This list will be further defined and submitted to GWRC as a separate document. Confirmed minor changes will be defined in SSEMPs.

3.5.2 ESC Installation Process and Decommissioning

ESCs will be installed prior to and during all construction activities. Upon completion of the installation of all approved structural ESCs as-built certification plans will be provided to Council in writing prior to the activity commencing. The Project will submit certification documentation 2 Working Days prior to the commencement of construction in that area of work as per condition E.6 and will retain the as-built record on site.

An on-site pre-construction meeting with GWRC will be undertaken prior to the installation of ESC measures, signalling the start of the bulk earthworks. Additional pre-construction meetings will be held prior to construction activities considered to be high risk. This will be confirmed in consultation with GWRC as the Project progresses.

As per Condition E.8 ESCs will not be removed or decommissioned from a site, or stage before the contributing area is stabilised, unless such removal and decommissioning is in accordance with the CEMP or a SSEMP, and the Manager has been informed not less than 2 Working Days prior.

The Site Engineer for the specific location will discuss removal proposals as they are developed. Plans to remove controls will be discussed with the GWRC representative during site visits as the Project progresses. Controls will generally only be removed upon completion and appropriate stabilisation of an area or due to staging of works and subsequent changes in controls being required to facilitate construction.

4 RISK MANAGEMENT

4.1 Overall Risk Assessment

Estimating sediment yields for the Project occurred through the BoI process and generally followed procedures within the Universal Soil Loss Equation (USLE). The primary purpose of the USLE is to provide a measure of the risk of sediment generation and yields, and to assist in identifying controls required for managing this risk to the environment from sediment discharges from earthworks sites.

The USLE recognised that the soil composition is predominantly composed of sands and gravels and so soil particle sizes are generally large and heavy when compared to that of silt and clay soils.

When the percentage increase of sediment yield due to construction was assessed against that of the whole catchment, the percentage increase for the three watercourses of significance (identified in the CEMP) is in the order of:

- 0.2% for the Waitohu catchment;
- 0.003% for the Ōtaki River catchment;
- 0.1% for the Mangaone catchment.

The USLE evaluation does however also identify catchments that are much more sensitive to the effects of construction. In such locations particular attention will be required to minimising sediment generation. The areas sensitive to the effects of sediment discharge (based on the principle of a higher yield over the existing baseline) are summarised below:

- Railway Wetland – Approx CH 1540 to CH 1860
- Otaki River – Approx CH 3440 to CH 3840

These two locations contain 85,000m^3 and 200m^3 cuts and 44900m^3 and 20500m^3 fills respectivly, thus as a result become a higher risk. Associated SSEMPs will recognise and allow for this risk profile.

Overall the key ESC risks for the Project are:

- exposure of bare land;
- receiving environment locations and their associated values;
- works within and adjacent to watercourses and wetlands such as culvert placement and extensions, stream diversions and bridge works;
- pumping of sediment laden water from excavations; and
- stockpiling of excess spoil material.

Areas of greater slope also present a higher risk of sediment yield during earthworks. To minimise risk, these steeper areas will receive a focus to ensure the slope lengths are reduced and progressive stabilisation occurs on a proactive basis.

Emphasis will be placed upon the adaptive monitoring and maintenance of all controls installed and the methodologies utilised with particular attention paid to areas of higher risk prior to, during and after rain events.

The main construction activities will have varying risk profiles. A summary of these main activities and the type of ESC likely to be associated with each activity is outlined below in table 2 below. This is an

indicative guide to demonstrate how activity type will be included in risk assessments. Specific details of each main activity and associated ESC will be included in the SSEMPs.

Table 2: Main construction activities and associated ESC

Activity	Brief description	Typical ESC and specific considerations
Pre-load and sand / alluvial environment	Placement of sand or granular material over the alignment. Following desired settlement, this surcharge material is subsequently removed.	Diversion bunds will be the common control type with fitted floating decants where appropriate. Infiltration will be the dominant form of treatment, particularly in sand and alluvial environments.
Peat replacement	Undercut of peat material which is carted to other areas of the site to be stockpiled prior to use. The area is then backfilled progressively.	Diversion bunds will be the common control type with fitted decants where appropriate. DEBs may also be utilised in areas where infiltration is inadequate. Pumping from peat excavations will be a necessary part of the works methodology. All pumping will require a permit to pump and forward planning to incorporate disposal / treatment areas (if required).
Bridge Construction	Bridge construction will involve piling, reinforced concrete column and crosshead construction. Bridge beams will be cast off-site.	Works within the flood plain will be a key risk. ESC will have a strong focus on non-structural practices such as utilising weather forecasting and flood warnings, planning and set out of the site will be important such as ensuring that machinery is located out of the flood plain during high stream flows. Maintaining a stabilised site where possible will be a strong focus also to reduce potential for sediment re-suspension.

The locations identified below (refer to Appendix D of this ESCP for associated plans) are specifically mentioned within Condition E.1 as higher risk and susceptible to erosion and sediment deposition. The following offer a general description of each area with more specific methodologies to be outlined in the relevant SSEMP. Appropriate ESC measures will be utilised which align with the risk profiles of each high-risk location.

4.2 Northern Dunescape

This location coincides with the same high risk area identified through the application process and the associated USLE calculations. The primary reason for the risk profile is related to the 180,000m^3 cut in this location. It is assessed that the methodologies to be utilised within this area including cleanwater diversions and dirty water diversions will adequately address the necessary ESC aspects. Soil types in this location are noted to have high infiltration which will also assist with minimisation of sediment generation.

The adaptive management regime (refer to Section 6) including that associated with monitoring after trigger events and associated checks and continuous improvement will also ensure appropriate management of the risk in this location.

4.3 Otaki River

One of the major construction risks identified for the Ōtaki River Bridge works is potential flooding of the river bed during works.

From a physical ESC perspective the key risk minimisation tool is that associated with methodologies. All bridge pile construction will be undertaken outside of the stream channel to which the bridge applies. In addition:

- Weather forecasting will be undertaken using *www.metvuw.co.nz* which will provide an indication when high rain events are predicted and as such stream flows are also expected to be higher.
- Prior to predicted periods of high stream flows, all high environmental risk activities, such as the use of wet concrete, will cease within the flood plain area.
- While some temporary storage of fuels or storage of hazardous substances will be within the flood plain area they will be removed prior to and during flood events and all refuelling for activities in these locations will be via mobile units only.
- Prior to predicted periods of high stream flows, where practicable, all machinery, including mobile pumps will be moved to outside of the flood plain area.
- Any dewatering will be undertaken with particular care to ensure pH and water quality issues do not arise.
- Stabilisation of the site will be a key focus to ensure that the re-suspension of site sediment is minimised where practicable.

4.4 Railway Wetland

Working in and around the Railway Wetland is also assessed within the consent conditions as higher risk. 'Clean' water from the upper Te Manuao catchment will need to be diverted around the works. The specific details of the proposed ESC measures will be included in the relevant SSEMP.

Importantly the adaptive management regime (refer to section 6) including that associated with monitoring after trigger events and associated checks and continuous improvement will also ensure appropriate management of the risk in this location.

4.5 Streamworks

Streamworks activities are considered higher risk due to their location in or adjacent to water. At all practical times these activities, and any associated works within these environments will be undertaken in a "dry" environment. This will be based upon diversion of flows around the area of works or working directly above the stream with no formal stream diversion required. Consideration will also be given to the fish spawning and migration periods, during which time instream works will be restricted.

Culvert installation, both temporary construction and permanent, is required in a number of locations with the key purpose of the culvert installations to allow for road construction, with the culverts providing for a dry environment over which the construction activity can then occur.

Where culvert installation or extension is required within a stream channel this can be undertaken by two main methodologies, pumping around the area of works or establishment of a temporary diversion around the culvert footprint or a full stream diversion.

Prior to works commencing the specific methodology will need to be determined and will be detailed within the SSEMP for that location. This determination will be based upon stream flows and upstream catchment areas, timing of works and the expected duration of works.

The typical methodology for pumping around the works area is as follows:

- A pump will be installed approximately 5m upstream of the extent of an upstream temporary plug. This pump will pump upstream flows around the work area to discharge back into the watercourse downstream of the culvert works and a downstream temporary plug. Sand bags or similar will be used to impound flows for this pump. The inlet of the pump will be supported above the base of the stream and will contain a fish grill such that no fish can enter the pump intake structure.
- With the pumping in place, fish rescue and relocation methods will be carried out by the project ecologist as per the requirements of the Ecological Management Plan and relevant SSEMP.
- Following approval form the project ecologist, pumping in accordance with a permit to pump, and excavation of the works area will commence to remove unsuitable material.
- Once all unsuitable material has been removed, the culvert area will be subject to ground improvement if necessary and will be backfilled with structural material to an appropriate depth for culvert installation. The culvert will be installed with associated wingwalls, retaining walls and backfill as necessary. Rock rip-rap erosion control will also be installed at the inlet and outlet of the culvert.
- Appropriate ESC will be installed and any disturbed area will be fully stabilised.
- With the necessary ecological signoff stream flows can then be diverted through the new culvert structure.

The typical methodology for a temporary / permanent diversion is as follows:

- Excavation of the diversion channel will occur, to design drawings, leaving a "plug" at each end so that the stream does not breach the diversion.

- Stabilisation of the diversion channel will occur if required by design to ensure it does not become a source of sediment.
- Any water within the works area will be pumped in accordance with an approved Permit to Pump.
- Once the diversion channel has been certified by the Environmental Team, the downstream plug will be removed to allow stream flows to flow up the diversion channel, keeping some water within the channel to reduce scour problems when the upstream plug is also removed. The upstream plug can also then be removed allowing stream flows through the diversion channel.
- A non-erodible dam will be immediately placed in the upstream end of the original channel. Material will then be placed up to this barrier to allow the necessary filling or activity to occur.
- A non-erodible downstream dam will be immediately placed to prevent backflow into the construction area. Fish recovery from the original channel will then occur and the channel drained by pumping.
- The original channel can then be backfilled forming part of the construction or the specific activity, such as culvert installation, undertaken.
- Material excavated from the diversion itself will be placed in stockpiles away from the stream diversion.
- Once the works within the original channel has been completed, appropriate ESC will be installed and the site stabilised as required.

5 ESC ROLES AND RESPONSIBILITIES

Table 3 - Erosion and Sediment Control Responsibilities

Organisation	Responsibilities
PP2O Project Team	Preparation of E&SCP and subsequent reviews and amendments Preparation of SSEMPs. Implementation of SSEMPs. Installation of E&SC devices. Asbuilting devices. Inspection and Maintenance of E&SC devices. Auditing devices. Ongoing monitoring. Record keeping. Stabilisation activities. Training. Reporting.
Greater Wellington Regional Council	Certification of ESCP and amendments Certification of SSEMPs. Certification of SSEMP changes. Auditing to ensure compliance with SSEMPs.

All people working on site will be required to undertake a formal induction and training process as detailed in the CEMP and within Condition G.24. Those with site management responsibilities will be required to attend additional environmental awareness training. This is detailed within the CEMP. In addition, ongoing training opportunities will be identified throughout the course of the Project in response to issues or challenges identified.

In terms of identification of specific staff with defined roles, this is defined in the CEMP and will be confirmed through the provision of the SSEMPs.

6 ESC ADAPTIVE MONITORING AND MANAGEMENT

6.1 Adaptive Monitoring Approach

In accordance with this ESCP and Condition G.39-G.42, an adaptive management approach will be applied to respond to potential effects of sediment discharge.

Adaptive monitoring enables a 'plan-do-check-act' approach whereby the ongoing monitoring and reporting creates a continuous improvement loop which can subsequently assist and improve the environmental control measures, monitoring methodology and general works. Adaptive management in the context of this ESCP specifically relates to the management of sediment discharges from earthworks to avoid, remedy and mitigate any adverse effects on the receiving environment.

The intent of the adaptive management is to enable a reaction to monitoring results that arise during the construction of the Project. The results collected as part of the monitoring can be used to learn from wet weather events / spillages leading to down-gradient sediment discharges. There may then be a subsequent action to put in place alternative measures to manage ESC if situations occur where standard good practice measures have been unable to achieve their expected outcomes. This process effectively follows the requirements set out in Condition G.42 which has been summarised in Figure 2 below.

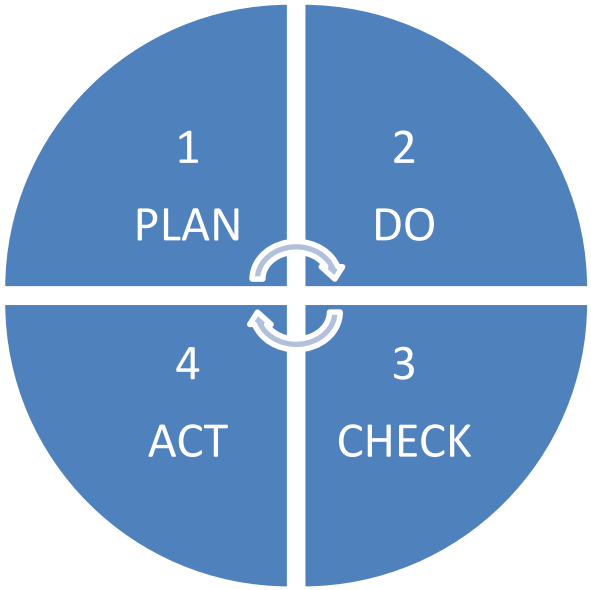

Figure 1: Adaptive Monitoring Process

6.2 Erosion and Sediment Control Devices Monitoring

Environmental compliance for the Project during the construction period is based upon the appropriate installation, location, maintenance, and monitoring of control devices. Importantly the devices are not restricted to structures and may include work practices and methodologies.

'Devices' monitoring,primarily undertaken by the site foreman and associated environmental specialists, comprises the monitoring of on-site construction activities, and the on-site structures and devices designed to control the potential adverse effects of those site activities such as silt fences, mulching requirements and decant systems.

This monitoring is aimed at the early detection of activities or problems that have the potential to result in a significant adverse environmental effect. Devices monitoring will be the main component of scheduled construction monitoring undertaken on-site. The devices monitoring will act as a trigger for more detailed monitoring and reporting in accordance with Condition E.4 (Figure 2), and Condition G.42 (Figure 3) should this be required.

Ongoing site monitoring by the Project Team will occur as follows:

- Informal visual monitoring will be on going during construction with site personnel responsible for making daily checks of the controls and the immediate receiving environment in the immediate vicinity of their work site. Any repairs required will be noted in their daily diaries and actioned accordingly.

- A weekly site inspection will be undertaken by the environmental team checking controls and the immediate receiving environment for compliance and maintenance requirements. Actions required as a result of these inspections will be identified and close out dates and responsibilities assigned.

- Daily weather reports will be provided, including the predictive forecast, to all Project staff to facilitate project planning. This will be reviewed in detail prior to undertaking high risk activities such as stream diversions.

Visual inspections will include checking:

- the integrity and effectiveness of all erosion control and sediment treatment devices;
- Site activities, noting where works have progressed beyond the capability of existing devices;
- general site conditions and other activities occurring within the catchment;
- general status of the immediate receiving environment i.e. conspicuous change in downstream water quality or accululation of sediment at the discharge location;
- Streambank collapse or erosion attributable to the Project discharge points;
- Spillages or other incidents

Prior to construction commencing, photographs will be taken in the vicinity of the proposed discharge outlet points and any streams in the vicinity of the works. These records will show the visual state of the receiving environment at and within the vicinity of the discharge point. This photographic record will be compiled into a log book and will allow a visual comparison of before, during and at completion of the construction of the Project.

6.3 Trigger Related Monitoring

6.3.1 ESC Performance

In the event of a failure of an ESC device or storm exceedance of the device design volume, then the process below in Figure 2 will be followed in accordance with Condition E.4. Note that Condition G.42 requirements have been referenced in Figure 2 (in pink) for clarity. The full description of Condition E.4 has been attached as Appendix G.

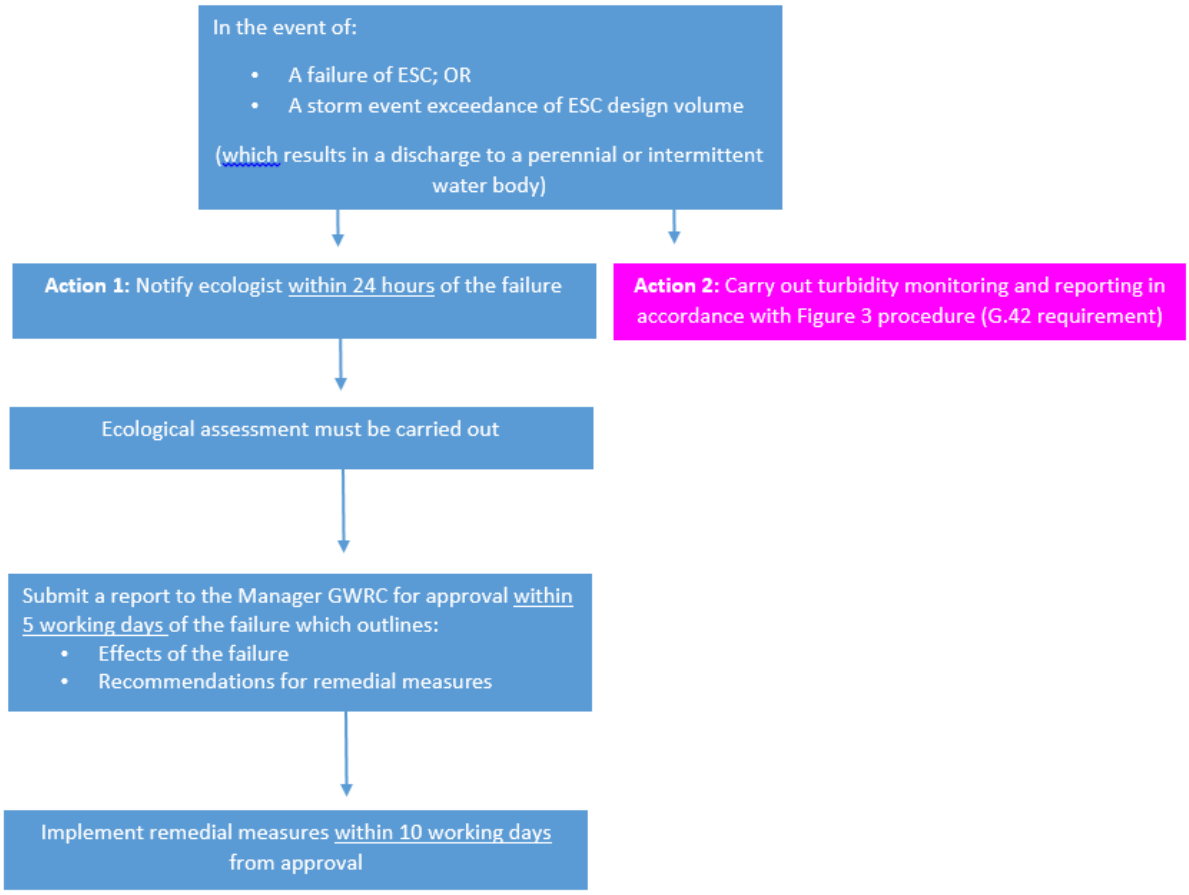

Figure 2: Triggered actions in the event of ESC failure (Condition E.4)

6.3.2 Rainfall Triggers

The Project will record actual rainfall records for the alignment through on site rain gauges. It is recognised that this rainfall is variable throughout the Project and two rainfall gauges will be necessary

for this purpose. This rainfall record will hence be based on two gauges utilising existing and newly established gauges as required.

Rainfall triggers are set as:

- 7mm over any 1 hour period; or
- 20mm over any 24 hour period

The rain gauges will be monitored (and telemetered) to allow the determination of such triggers to be established. The procedure to follow in the event of this trigger is set out below in Figure 3 which is required by Condition G.42. The full description of Condition G.42 has been attached as Appendix G.

In addition, where rain is forecast[1] then a specific site inspection will occur to ensure ESC measures are in place and fully maintained and that machinery is away from streams and out of floodplain locations. As part of this forecast rain response there may be the requirement to undertake remedial works, stabilise some exposed areas and adaptive management of the ESCs.

Following a rainfall event or where practicable during a rainfall event, irrespective of the above rainfall trigger level exceedance, inspections will be undertaken to assess performance of ESC devices. Where visual observation suggests that devices are not working effectively then the procedures outlined in Figure 2 above, and/or Figure 3 below will be followed as necessary.

6.3.3 Turbidity Triggers

Turbidity monitoring will be carried out immediately following a rainfall trigger exceedance, and/or in the event of a dirty water discharge to water as per E.4 (Figure 2), and will be repeated at 24 hours and 48 hours from the trigger. If hand-held sampling, 3 measurements will be taken to ensure a representative reading is obtained, with the median value from these readings used. Figure 3 below outlines the full process to be followed in accordance with G.42. Note that Condition E.4 reference has been added to Figure 3 (in pink) for clarity.

[1] *Metvuw will be utilised for forecast rain*

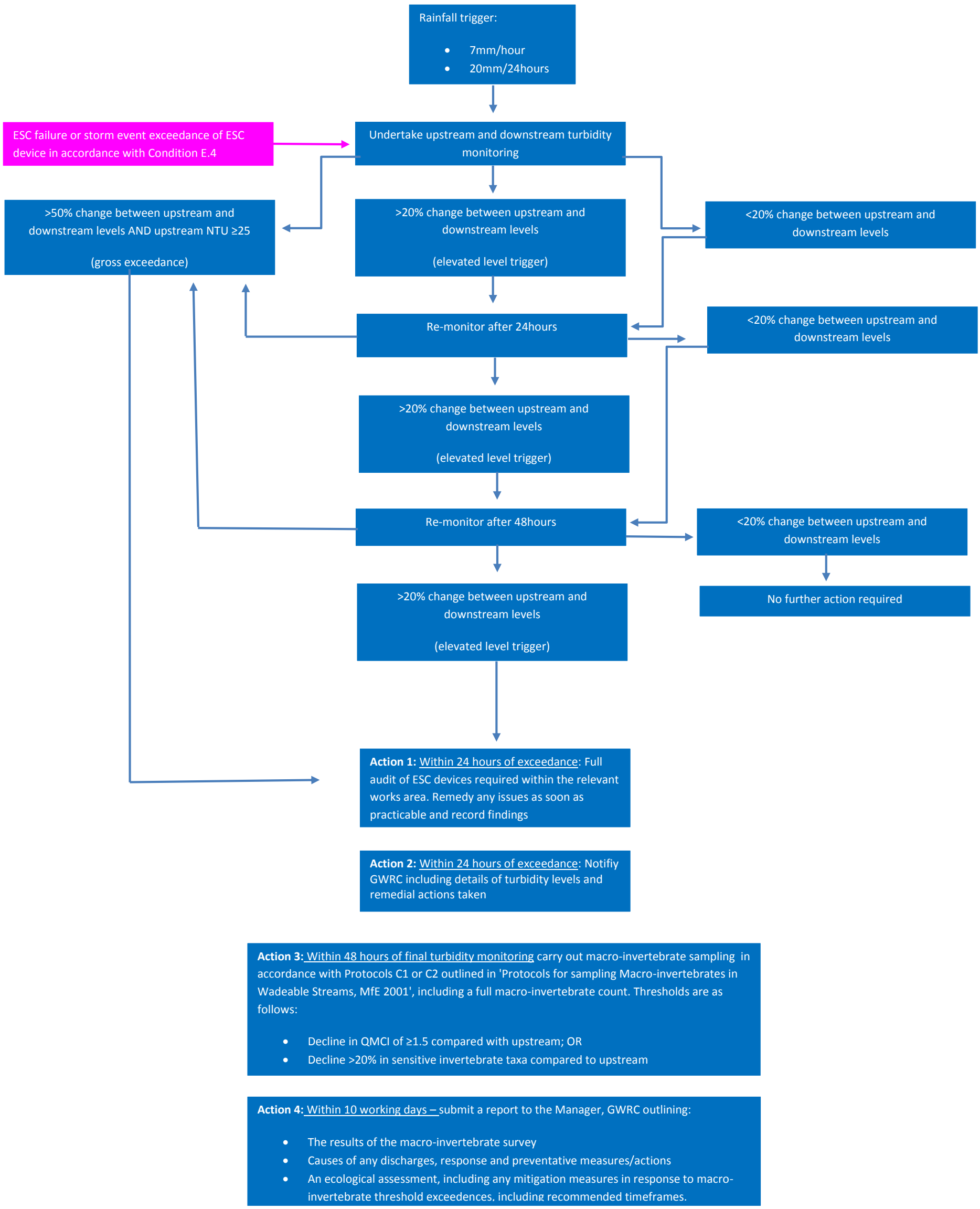

Figure 3: Condition G.42 Adaptive Management and Monitoring Procedure

6.4 Flocculation Monitoring

While not envisaged as required through the Project construction, chemical treatment may be required in circumstances where the discharge water quality is not considered appropriate for the receiving environment. Although bench testing has not been carried out using soils from the PP2O project, recent success using Polyaluminium Chloride (PAC) on the nearby M2PP Project provides useful baseline information in the event that chemical treatment is required. Specific information regarding bench testing, optimum dose rates, and an appropriate monitoring regime will be outlined in the relevant SSEMPs in accordance with Condition E.9.

6.5 Other Checks and Inspections

Other on-site activities such as storage of hazardous chemicals, refuelling facilities and practices, site offices, haul roads, stock-piles, dust control, and construction will also be regularly checked and audited. The intention underlying these checks is to ensure that they are being properly maintained at all times, and that they remain within the specified standards including consent conditions.

7 REFERENCES

Auckland Regional Council (March 1999). Erosion & Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region, Technical Publication No. 90.

Auckland Regional Council (April 2000). Low Impact Design Manual for the Auckland Region, Technical Publication No. 124.

Auckland Regional Council (1996). The Environmental Impacts of Accelerated Erosion and Sedimentation. Technical Publication No. 69.

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Environment Bay of Plenty (June 2010). Erosion and Sediment Control Guidelines for Land Disturbing Activities.

Environment Waikato (January 2009). Erosion and Sediment Control - Guidelines for Soil Disturbing Activities" (Technical Report No.2002/01).

Goldman, S.J., Jackson, K., Bursztynsky, T.A. (1986). Erosion and Sediment Control Handbook, McGraw-Hill Book Company.

Hicks, Murray (July 1994). Storm Sediment Yields from Basins with Various Landuses in Auckland Area, prepared for Auckland Regional Council.

Opus International Consultants Limited. Peka Peka to North Otaki Expressway Project Draft Erosion and Sediment Control Plan, Draft V2 April 2013.

OPUS International Consultants Limited, PP2O Environmental Baseline Monitoring Turbidity, Status Final. December 2016

Winter, R, 1998: Predicting Sediment Yield During the Earthworks Development Stage of a Subdivision, Auckland and Assessment of the Efficiency of a Sediment Retention Pond. MSc Thesis, University of Waikato.

Greater Wellington Regional Council (September 2002). Erosion and Sediment Control Guidelines for the Wellington Region (Wellington Guidelines).

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NZTA (September 2014). Erosion and Sediment Control Standard for State Highway Infrastructure, Construction Stormwater Management.

APPENDIX A: CLEAN WATER DIVERSION TABLE

Clean Water Diversion Sizing

Project:	**PP20 Clean Water Diversion**		
Calculations By:	**Graeme Ridley**	**Date:**	**31/01/2017**
Checked By:		**Date:**	
Element:	**Clean Water from Above Site**		

Step 1 -

C=	0.4		
I =	32.8	mm	HIRDS Data (20yr 60min Duration Rainfall Depth)
A =	10	ha	(Catchment Drawings)

Q =	0.365	m^3/s	Design Flow Required
Q =	364.74	l/s	Design Flow Required

$$Q = .00278CiA$$

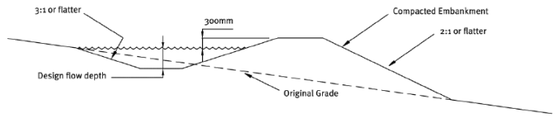
Step 2 - Determine Diversion Drain Sizing

Cross Section Area =	0.4725	m^2
Top Width =	1.7	m
Hydraulic Radius =	0.237	
Capacity =	0.382	m^3/s
Design Flow =	0.365	m^3/s

b=	1	m
d=	0.35	m
e=	0.35	m (e=d)
Z=	1	

Slope =	10.00%
n =	0.150

Figure 8-5.
Cross section of Dirty Water Diversion



$$Q = \frac{A\,R^{2/3}\,S^{1/2}}{n}$$

Channel	**OK: Channel Capacity > Design Flow**	

Actual Channel Dimensions Required - Including 300 mm Freeboard

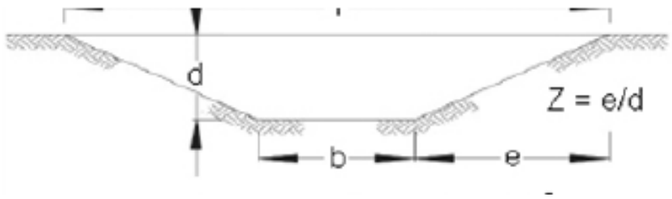
b=	1	m
d=	0.65	m
e=	0.65	m

Total Channel Width	2.3	m

Check For Channel Full Velocity

V=	0.81	m/s	V = Q / A

Stabilise with Vegetation



Appendix A - CWD Dimensions - PP2O

PP2O Clean Water Diversion Sizing

Notes: The minimum bund heights detailed in this table are those required to convey runoff from the 20 year ARI Storm Event plus 300mm freeboard
All cleanwater diversions are to be stabilised where existing vegetation cannot be retained.
Dimensions based on a trapezoidal channel with either 0.5m or 1.0m base and 1:1 side slopes (Note if side slopes are amended to 2:1 then depth can be reduced accordingly)
Rainfall based on HIRDS data at Otaki River location
Bund Dimensions Rounded to Nearest 0.05m
Runoff coeficients based on pasture/grass cover on medium soakage soils

Longitudinal Slope based on 10% (as a maximum)

Catchment Area (ha)	20 Year ARI Design Flow (m3/sec)	CWD Bund Height (1.0m Base) plus Freeboard (300mm) (m)	CWD Bund Height (0.5m Base) plus Freeboard (300mm) (m)
0.5	0.018	0.4	0.4
1	0.036	0.4	0.45
1.5	0.055	0.45	0.5
2	0.073	0.45	0.5
2.5	0.091	0.5	0.55
3	0.109	0.5	0.55
3.5	0.128	0.5	0.6
4	0.146	0.55	0.6
4.5	0.164	0.55	0.65
5	0.182	0.55	0.65
6	0.219	0.6	0.7
7	0.255	0.6	0.7
8	0.292	0.65	0.75
9	0.328	0.65	0.75
10	0.365	0.65	0.8

Longitudinal Slope based on 5% (as a maximum)

Catchment Area (ha)	20 Year ARI Design Flow (m3/sec)	CWD Bund Height (1.0m Base) plus Freeboard (300mm) (m)	CWD Bund Height (0.5m Base) plus Freeboard (300mm) (m)
0.5	0.018	0.4	0.45
1	0.036	0.45	0.5
1.5	0.055	0.45	0.55
2	0.073	0.5	0.55
2.5	0.091	0.5	0.6
3	0.109	0.55	0.6
3.5	0.128	0.55	0.65
4	0.146	0.55	0.65
4.5	0.164	0.6	0.7
5	0.182	0.6	0.7
6	0.219	0.65	0.75
7	0.255	0.65	0.8
8	0.292	0.7	0.8
9	0.328	0.7	0.85
10	0.365	0.75	0.85

Longitudinal Slope based on 1% (as a maximum)

Catchment Area (ha)	20 Year ARI Design Flow (m3/sec)	CWD Bund Height (1.0m Base) plus Freeboard (300mm) (m)	CWD Bund Height (0.5m Base) plus Freeboard (300mm) (m)
0.5	0.018	0.45	0.5
1	0.036	0.5	0.55
1.5	0.055	0.55	0.65
2	0.073	0.6	0.7
2.5	0.091	0.6	0.75
3	0.109	0.65	0.75
3.5	0.128	0.7	0.8
4	0.146	0.7	0.85
4.5	0.164	0.75	0.85
5	0.182	0.75	0.9
6	0.219	0.8	0.95
7	0.255	0.85	1
8	0.292	0.9	1.05
9	0.328	0.95	1.1
10	0.365	0.95	1.15

Note: Dimensions based on an alternative bund shape (Section 4.1 Figure 2 of Erosion and Sediment Control Guidelines for the Wellington Region - see below), have been provided. A base of 0.5m has been assumed.

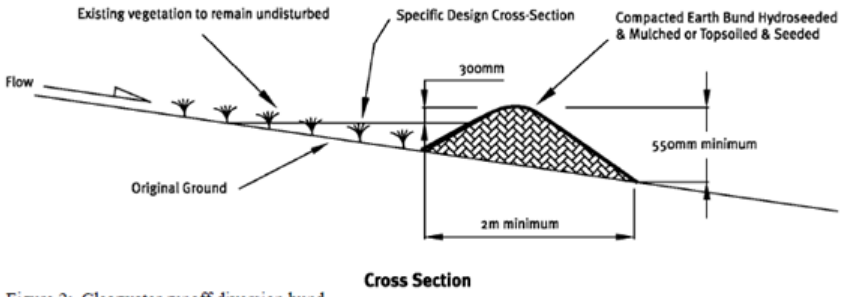


Figure 2: Clearwater runoff diversion bund

APPENDIX B: DIRTY WATER DIVERSION TABLE

DWD Diversion Sizing Spreadsheet

Project:	**PekaPeka**		
Calculations By:	**Graeme Ridley**	**Date:**	**31/01/2017**
Checked By:		**Date:**	
Element:	**Dirty Water as Required**		

Step 1 -

C=	0.6		
I =	32.8	mm	HIRDS Data (20yr 60min Duration Rainfall Depth)
A =	5	ha	(Catchment Drawings)

Q =	0.274	m^3/s	Design Flow Required
Q =	273.55	l/s	Design Flow Required

$$Q = .00278CiA$$

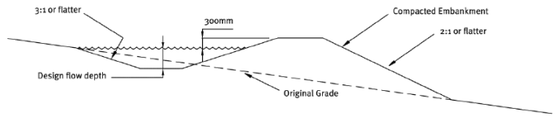
Step 2 - Determine Diversion Drain Sizing

Cross Section Area =	0.75	m^2
Top Width =	2	m
Hydraulic Radius =	0.311	
Capacity =	0.725	m^3/s
Design Flow =	0.274	m^3/s

b=	1	m
d=	0.5	m
e=	0.5	m (e=d)
Z=	1	

Slope =	10.00%
n =	0.150

Figure 8-5.
Cross section of Dirty Water Diversion



$$Q = \frac{A\,R^{2/3}\,S^{1/2}}{n}$$

Channel	**OK: Channel Capacity > Design Flow**

Actual Channel Dimensions Required - Including 300 mm Freeboard

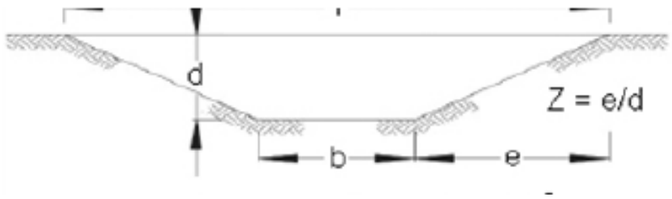
b=	1	m
d=	0.8	m
e=	0.8	m

Total Channel Width	2.6	m

Check For Channel Full Velocity

V=	0.97	m/s	V = Q / A

Stabilise Channel as required to minimise erosion
All DWD to try and achieve less than 2% slope



Appendix B - DWD Dimensions - PP2O

July 2017 ESCP

PP2O Dirty Water Diversion Sizing

Notes: The minimum bund heights detailed in this table are those required to convey runoff from the 20 year ARI Storm Event plus 300mm freeboard
Dimensions based on a trapezoidal channel with 1m base and 1:1 side slopes
Rainfall based on HIRDS data at Otaki River location
Bund Dimensions Rounded to Nearest 0.05m
Runoff coeficients based on bare soil on medium soakage soils

Longitudinal Slope based on 10% (as a maximum)

Catchment Area (ha)	20 Year ARI Design Flow (m3/sec)	DWD Bund Height plus Freeboard (300mm) (m)
0.5	0.027	0.4
1	0.055	0.45
1.5	0.082	0.45
2	0.109	0.5
2.5	0.137	0.5
3	0.164	0.55
3.5	0.191	0.55
4	0.219	0.6
4.5	0.246	0.6
5	0.274	0.6

Longitudinal Slope based on 5% (as a maximum)

Catchment Area (ha)	20 Year ARI Design Flow (m3/sec)	DWD Bund Height plus Freeboard (300mm) (m)
0.5	0.027	0.4
1	0.055	0.45
1.5	0.082	0.5
2	0.109	0.55
2.5	0.137	0.55
3	0.164	0.6
3.5	0.191	0.6
4	0.219	0.65
4.5	0.246	0.65
5	0.274	0.7

Longitudinal Slope based on 1% (as a maximum)

Catchment Area (ha)	20 Year ARI Design Flow (m3/sec)	DWD Bund Height plus Freeboard (300mm) (m)
0.5	0.027	0.45
1	0.055	0.55
1.5	0.082	0.6
2	0.109	0.65
2.5	0.137	0.7
3	0.164	0.75
3.5	0.191	0.8
4	0.219	0.8
4.5	0.246	0.85
5	0.274	0.85

APPENDIX C: PERMIT TO PUMP TEMPLATE

PERMIT TO WORK

PUMPING

M2PP-XXX-C-PERP-XXXX.DOCX

Permit Request	
Name of Contractor/Subcontract	
Description of Proposed Work	
Area/Location of Proposed Work	
Person in Charge of Work	
Position	
Contact number	

Any impurities other than sediment (i.e. cement contamination, oils)	
Pumping from	
Pumping to	
Size of pump/rate of discharge	
Estimated duration of pumping	
Pumping hours of operation, (i.e. 24/7 or during working hours only)	
Proposed commencement date	

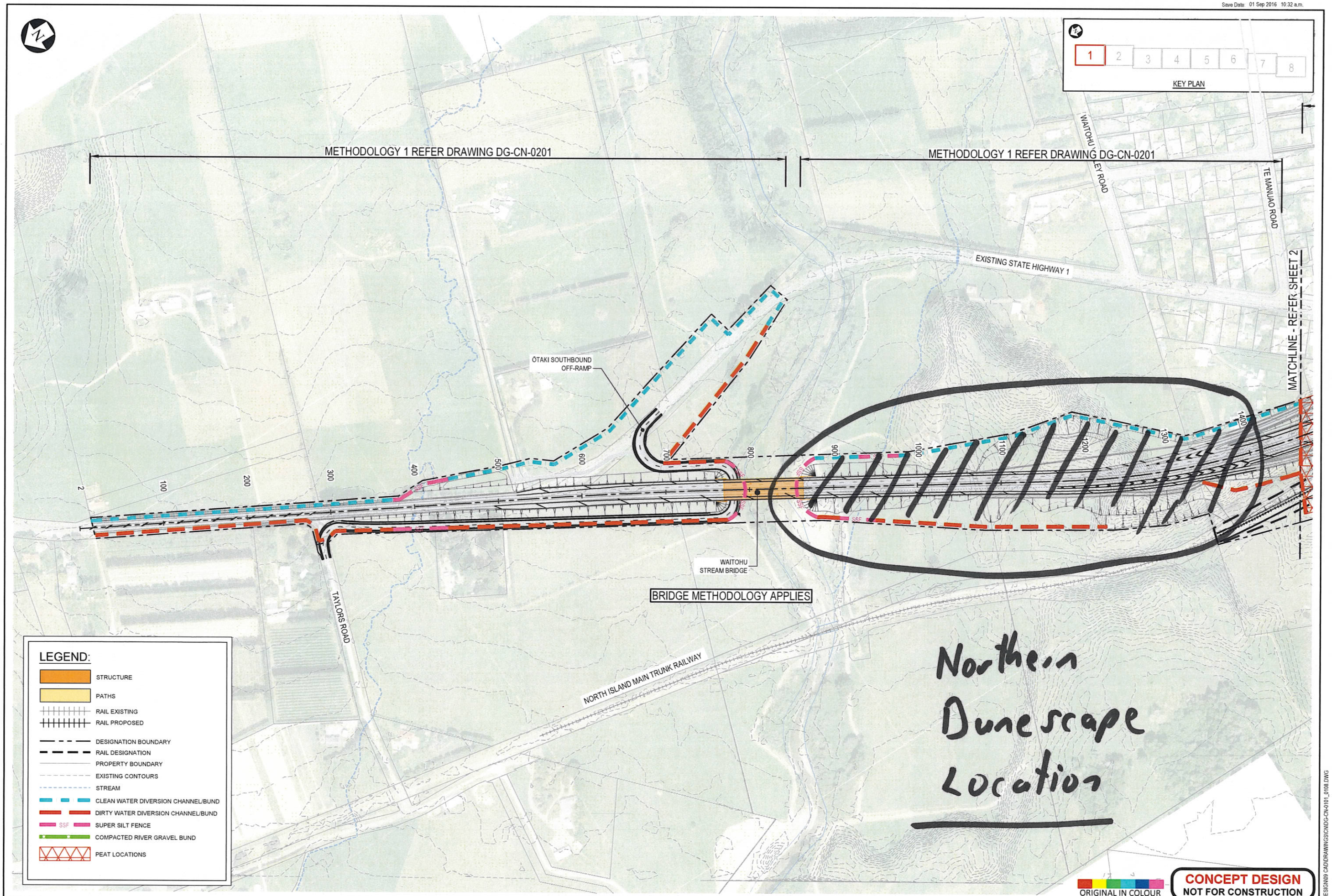
Controls/Monitoring	
Inlet controls	
Outlet controls	
Monitoring requirements	
Person responsible for monitoring	
Contact	

Authorisation	
Conditions	
Authorised by Environmental Manager or Environmental Advisor	
Date	

Receipt of Permit					
As the Person In Charge of Work I understand that I am responsible for informing the personnel under my control of the content and limits of this Permit. I confirm that the specified environmental requirements have been taken and authorise this Permit to go into effect.					
Name		Signature		Date	

APPENDIX D: E1 HIGH RISK LOCATIONS

Save Date 01 Sep 2016 10:32 a.m.



CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR CONCEPT DESIGN	MKV	GR	AG	06.09.16

Scale (A3) 1:4000	Design	G. Ridley	08.07.16
	Drawn	M. Vyas	22.08.16
	Drg Verifier	S. Findlay	31.08.16
	Drg Check	W. Cairns	31.08.16
Approved For Tender	A. Goldie	Date	06.09.16

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI

PEKA PEKA TO ŌTAKI EXPRESSWAY

Fletcher HIGGINS Beca Tonkin+Taylor

Subject	EROSION AND SEDIMENT CONTROL
Title	CONCEPTUAL PLAN SHEET 1 OF 8
Discipline	CONSTRUCTION
Drawing No.	DG-CN-0101
Rev.	A

ORIGINAL SIZE A3 DO NOT SCALE

IF IN DOUBT ASK

Document No. : Y:\08 DESIGN\09 CAD\DRAWINGS\CN\DG-CN-0101_0108.DWG

Save Date: 01 Sep 2016 10:32 a.m.

Railway wetland Location

METHODOLOGY 2 REFER DRAWING DG-CN-0202

METHODOLOGY 1 REFER DRAWING DG-CN-0201

TE ROTO ROAD

KEY PLAN

1 2 3 4 5 6 7 8

MATCHLINE - REFER SHEET 1

MATCHLINE - REFER SHEET 3

NORTH ŌTAKI MAIN ROAD UNDERPASS

COUNTY ROAD

RAHUI ROAD

RAHUI ROAD UNDERPASS

PROPOSED SECONDARY CONTAINMENT BUND

CHRYSTALLS STOP BANK

1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000

ŌTAKI NORTHBOUND ON-RAMP

NORTH ŌTAKI RAIL OVERPASS

PEAT LOCATION FROM CH 1500 TO 1800 IN CUT AND REQUIRES BUND AT NORTH AND SOUTH EXTENT ONLY

MILL ROAD

ARTHUR STREET

EXISTING STATE HIGHWAY 1

ŌTAKI RAIL STATION

MAINTENANCE ACCESS BAY

HARIATA STREET

DUNSTAN STREET

CUT AND COVER ON RAILWAY AS NECESSARY

NORTH ISLAND MAIN TRUNK RAILWAY

POTENTIAL STOCKPILE AND BORROW AREA

WAERENGA ROAD

LEGEND:

- STRUCTURE
- PATHS
- RAIL EXISTING
- RAIL PROPOSED
- DESIGNATION BOUNDARY
- RAIL DESIGNATION
- PROPERTY BOUNDARY
- EXISTING CONTOURS
- STREAM
- CLEAN WATER DIVERSION CHANNEL/BUND
- DIRTY WATER DIVERSION CHANNEL/BUND
- SSF SUPER SILT FENCE
- COMPACTED RIVER GRAVEL BUND
- PEAT LOCATIONS

ORIGINAL IN COLOUR

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revison	By	Chk	Appd	Date
A	ISSUED FOR CONCEPT DESIGN	MKV	GR	AG	06.09.16

Scale (A3) 1:4000

Design	G. Ridley	08.07.16	Approved For Tender A. Goldie
Drawn	M. Vyas	22.08.16	
Drg Verifier	S. Findlay	31.08.16	
Drg Check	W. Cairns	31.08.16	Date 06.09.16

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI

PEKA PEKA TO ŌTAKI EXPRESSWAY

Fletcher HIGGINS Beca Tonkin+Taylor

Subject: EROSION AND SEDIMENT CONTROL

Title: CONCEPTUAL PLAN SHEET 2 OF 8

Discipline: CONSTRUCTION

Drawing No.: DG-CN-0102

Rev.: A

ORIGINAL SIZE A3 DO NOT SCALE

IF IN DOUBT ASK

Document No.: Y:\08 DESIGN\09 CAD\DRAWINGS\CN\DG-CN-0101_0108.DWG

Save Date: 01 Sep 2016 10:32 a.m.

Otaki River Location

MATCHLINE - REFER SHEET 2

METHODOLOGY 1 REFER DRAWING DG-CN-0201

METHODOLOGY 1 REFER DRAWING DG-CN-0201

MATCHLINE - REFER SHEET 4

KEY PLAN

1 2 3 4 5 6 7 8

ŌTAKI RIVER

ŌTAKI GORGE ROAD

STRESSCRETE PLANT

ŌTAKI GORGE ROAD UNDERPASS

COMPACTED RIVER GRAVEL BUNDS TO PROVIDE FILTRATION AND IMPOUNDMENT AND FLOOD FLOWS

MAINTENANCE ACCESS BAY

3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500

ŌTAKI RIVER BRIDGE

WINSTONES QUARRY ACCESS

WINSTONES AGGREGATES

NORTH ISLAND MAIN TRUNK RAILWAY

EXISTING STATE HIGHWAY 1

EXISTING STATE HIGHWAY 1

NO DIRTY WATER DIVERSION REQUIRED AS FALLS AWAY FROM ALIGNMENT

SOUTH ŌTAKI RAIL OVERPASS

ADDINGTON ROAD

DIRTY WATER DIVERSION MAY MOVE TO THE EAST DEPENDENT UPON BORROW AREA ACTIVITY AND STOCKPILES

RIVERBANK ROAD

LEGEND:

- STRUCTURE
- PATHS
- RAIL EXISTING
- RAIL PROPOSED
- DESIGNATION BOUNDARY
- RAIL DESIGNATION
- PROPERTY BOUNDARY
- EXISTING CONTOURS
- STREAM
- CLEAN WATER DIVERSION CHANNEL/BUND
- DIRTY WATER DIVERSION CHANNEL/BUND
- SSF SUPER SILT FENCE
- COMPACTED RIVER GRAVEL BUND
- PEAT LOCATIONS

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No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR CONCEPT DESIGN	MKV	GR	AG	06.09.16

Scale (A3) 1:4000

Design	G. Ridley	08.07.16	Approved For Tender A. Goldie
Drawn	M. Vyas	22.08.16	
Dsg Verifier	S. Findlay	31.08.16	
Drg Check	W. Cairns	31.08.16	Date 06.09.16

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NZ TRANSPORT AGENCY WAKA KOTAHI

PEKA PEKA TO ŌTAKI EXPRESSWAY

Fletcher HIGGINS Beca Tonkin+Taylor

Subject: EROSION AND SEDIMENT CONTROL

Title: CONCEPTUAL PLAN SHEET 3 OF 8

Discipline: CONSTRUCTION

Drawing No.: DG-CN-0103

Rev.: A

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APPENDIX E: PROJECT CERTIFICATION TEMPLATES (EXAMPLES)

Note: Examples only – these documents may evolve over the life of the project.

ESC Certification

Zone:	Sector:	Date:
SSEMP Reference:		
Activity:		
Chainage:		
Required ESC: **Comments/Changes:**		

ESC Decommissioning

Zone:	Sector:	Date:
SSEMP Reference:		
ESC Measure:		
Chainage:		
Stabilisation and Decommissioning Process		
Comments/Sketch:		
Name: **Signature:**		

Note: This form is to be uploaded to the relevant internal document system and the link sent to GWRC.

Minor ESC Change

Zone:	Sector:	Date:
SSEMP Reference:		
Description of ESC Change:		
Chainage:		
Comments/Sketch:		
Name: **Signature:**		

Note: This form is to be uploaded to the relevant internal document system and the link sent to GWRC.

APPENDIX F: ABSTRACT OF EROSION AND SEDIMENT CONTROL PLANS

Note: Indicative only – not to be included in specific ESC approval process.

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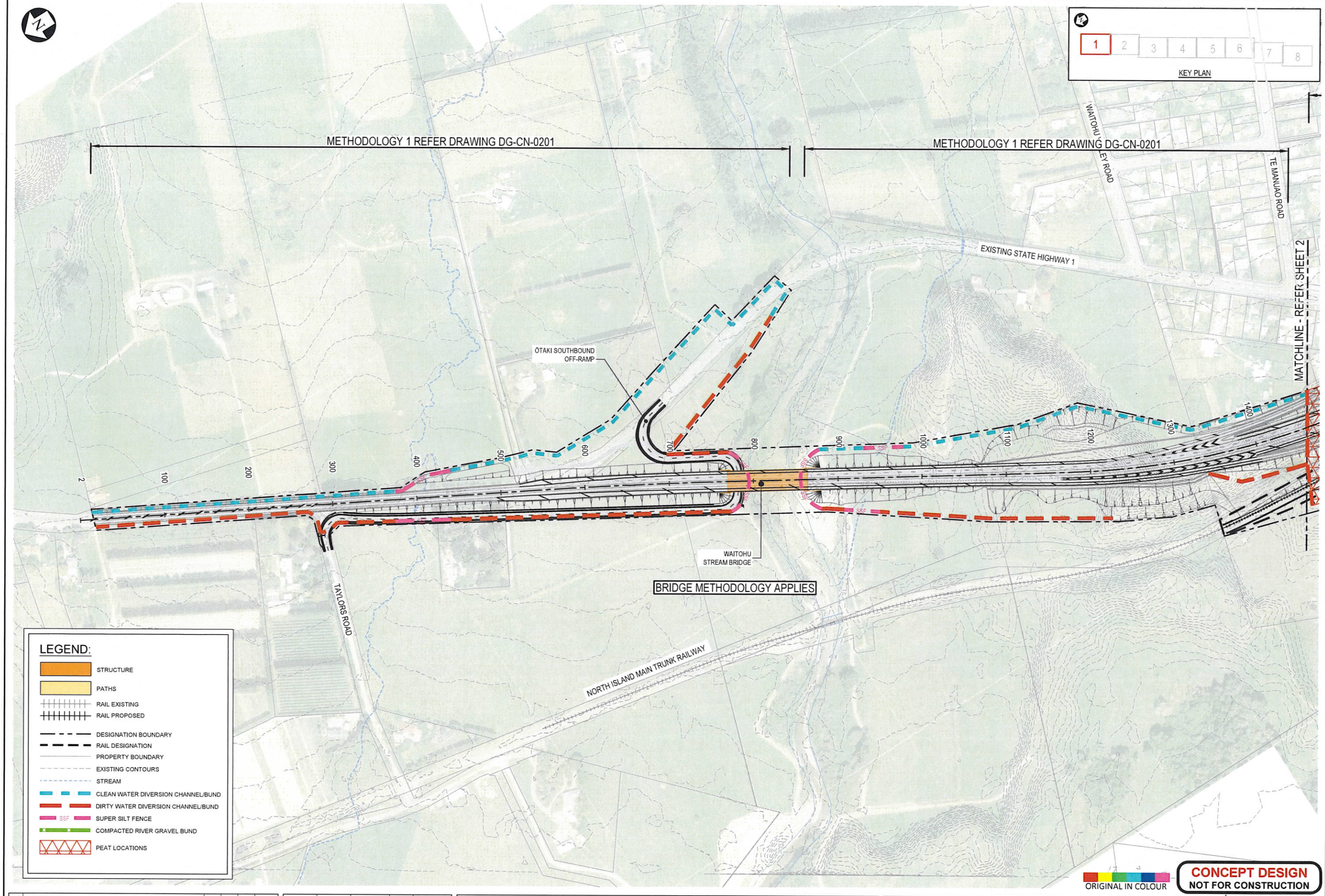

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Approved For Tender: A. Goldie, Date 06.09.16

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Subject: EROSION AND SEDIMENT CONTROL

Title: CONCEPTUAL PLAN SHEET 1 OF 8

Discipline: CONSTRUCTION

Drawing No.: DG-CN-0101

Rev.: A

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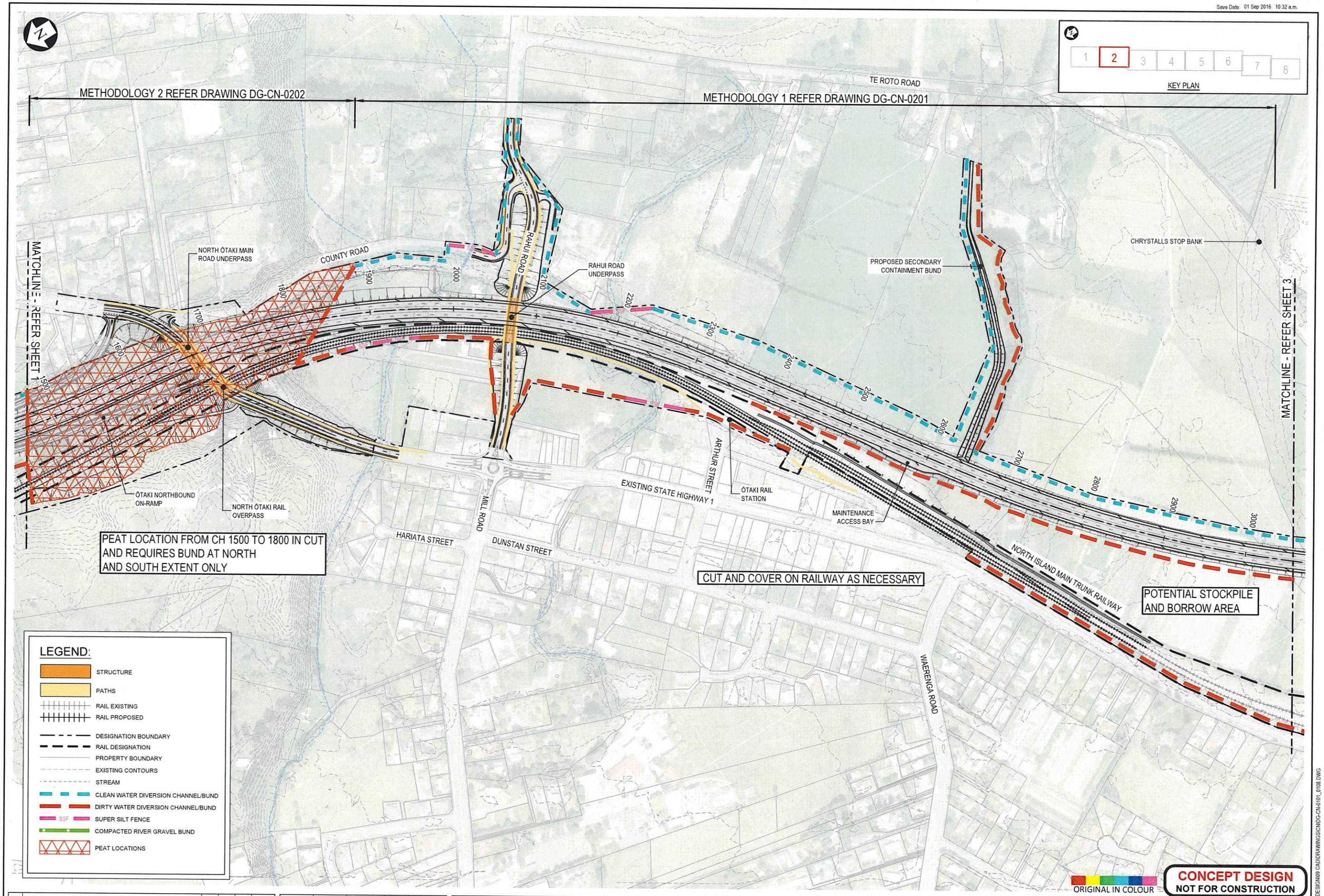

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Subject	EROSION AND SEDIMENT CONTROL
Title	CONCEPTUAL PLAN SHEET 2 OF 8
Discipline	CONSTRUCTION
Drawing No.	DG-CN-0102
Rev.	A

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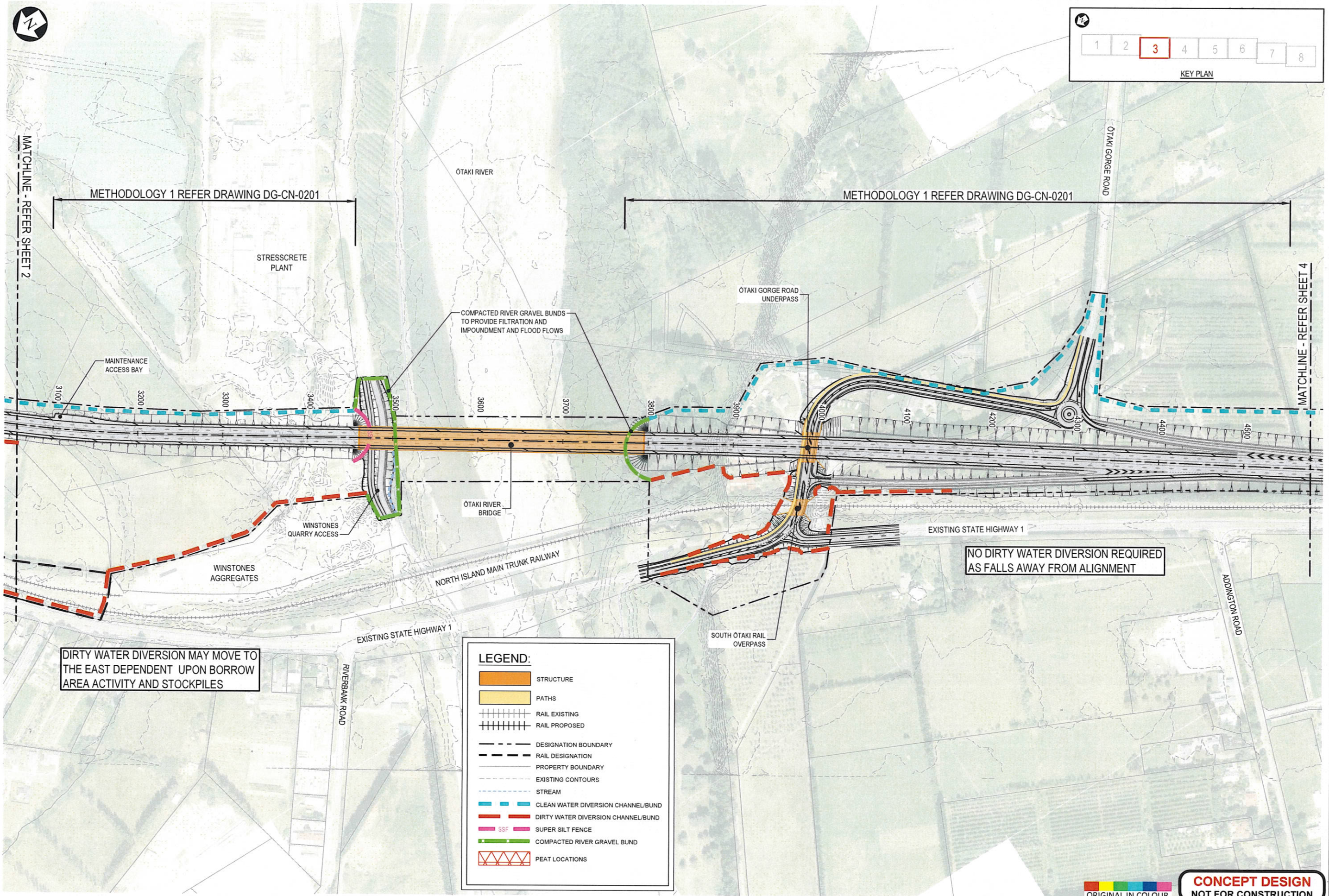

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Drg Check	W. Cairns	31.08.16	Date 06.09.16

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Subject: EROSION AND SEDIMENT CONTROL

Title: CONCEPTUAL PLAN SHEET 3 OF 8

Discipline: CONSTRUCTION

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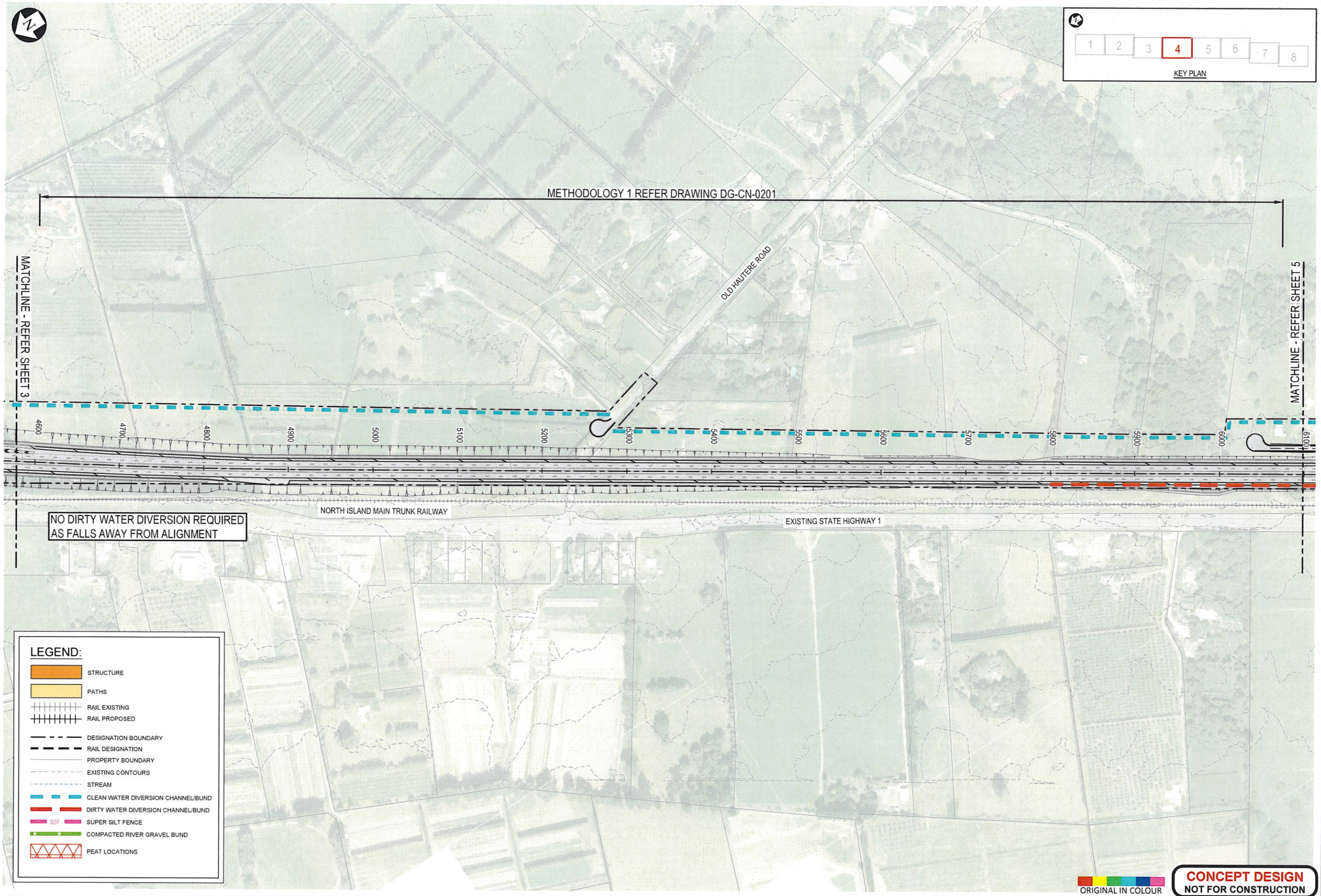

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Subject: EROSION AND SEDIMENT CONTROL

Title: CONCEPTUAL PLAN SHEET 4 OF 8

Discipline: CONSTRUCTION

Drawing No.: DG-CN-0104

Rev.: A

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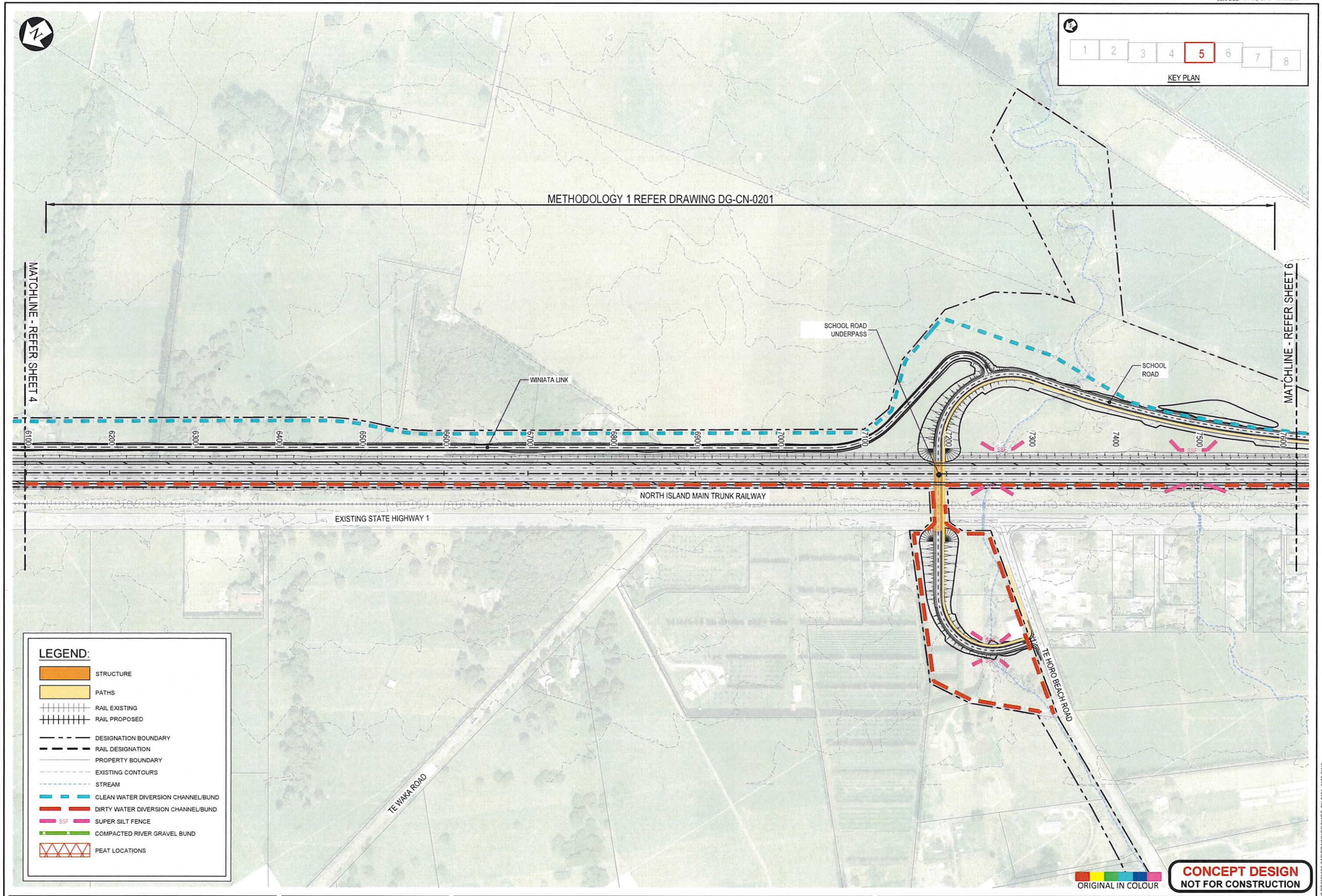

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Drg Check	W. Cairns	31.08.16

Approved For Tender: A. Goldie Date 06.09.16

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Subject: EROSION AND SEDIMENT CONTROL

Title: CONCEPTUAL PLAN SHEET 5 OF 8

Discipline: CONSTRUCTION

Drawing No.: DG-CN-0105

Rev.: A

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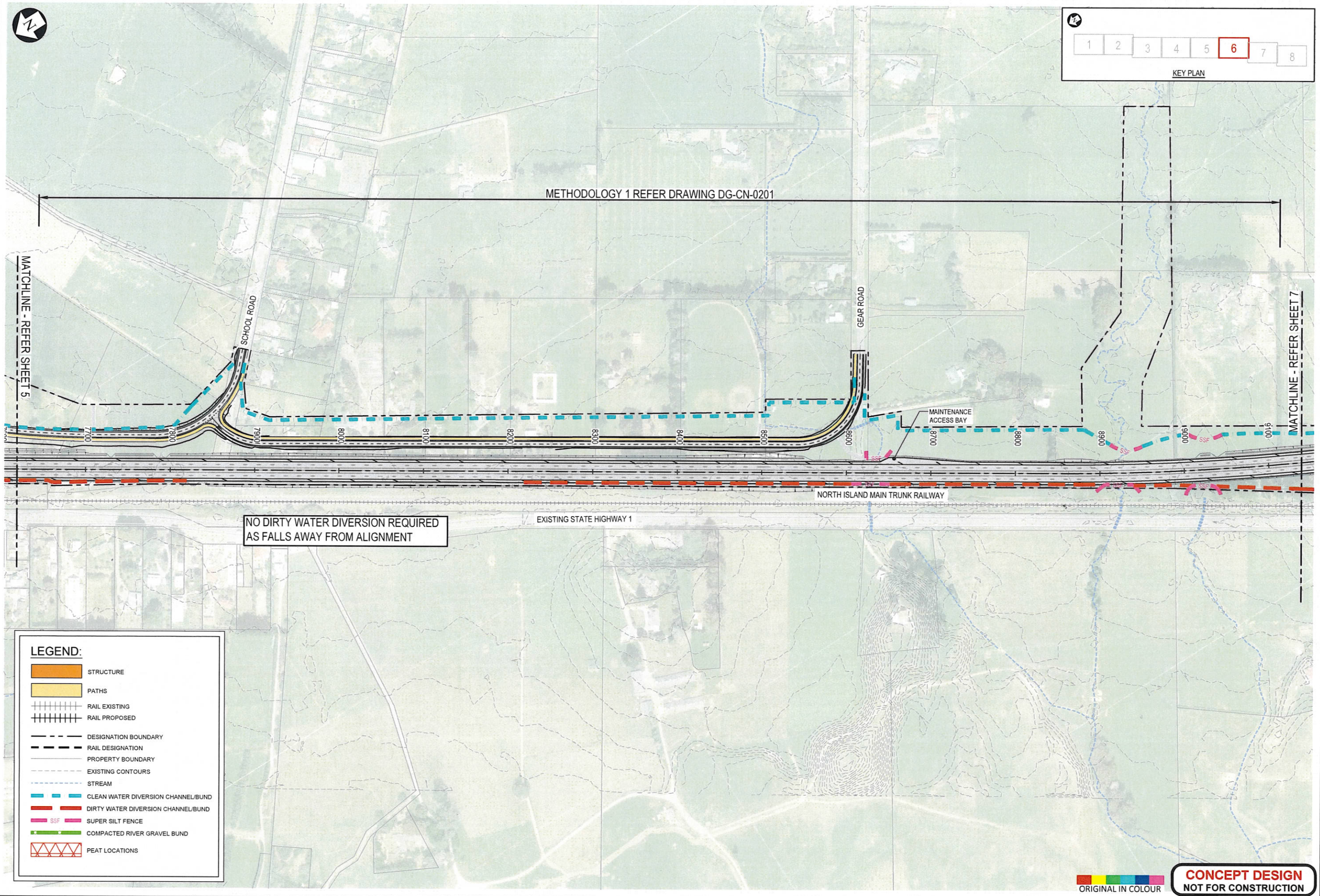

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Subject: EROSION AND SEDIMENT CONTROL

Title: CONCEPTUAL PLAN SHEET 6 OF 8

Discipline: CONSTRUCTION

Drawing No.: DG-CN-0106

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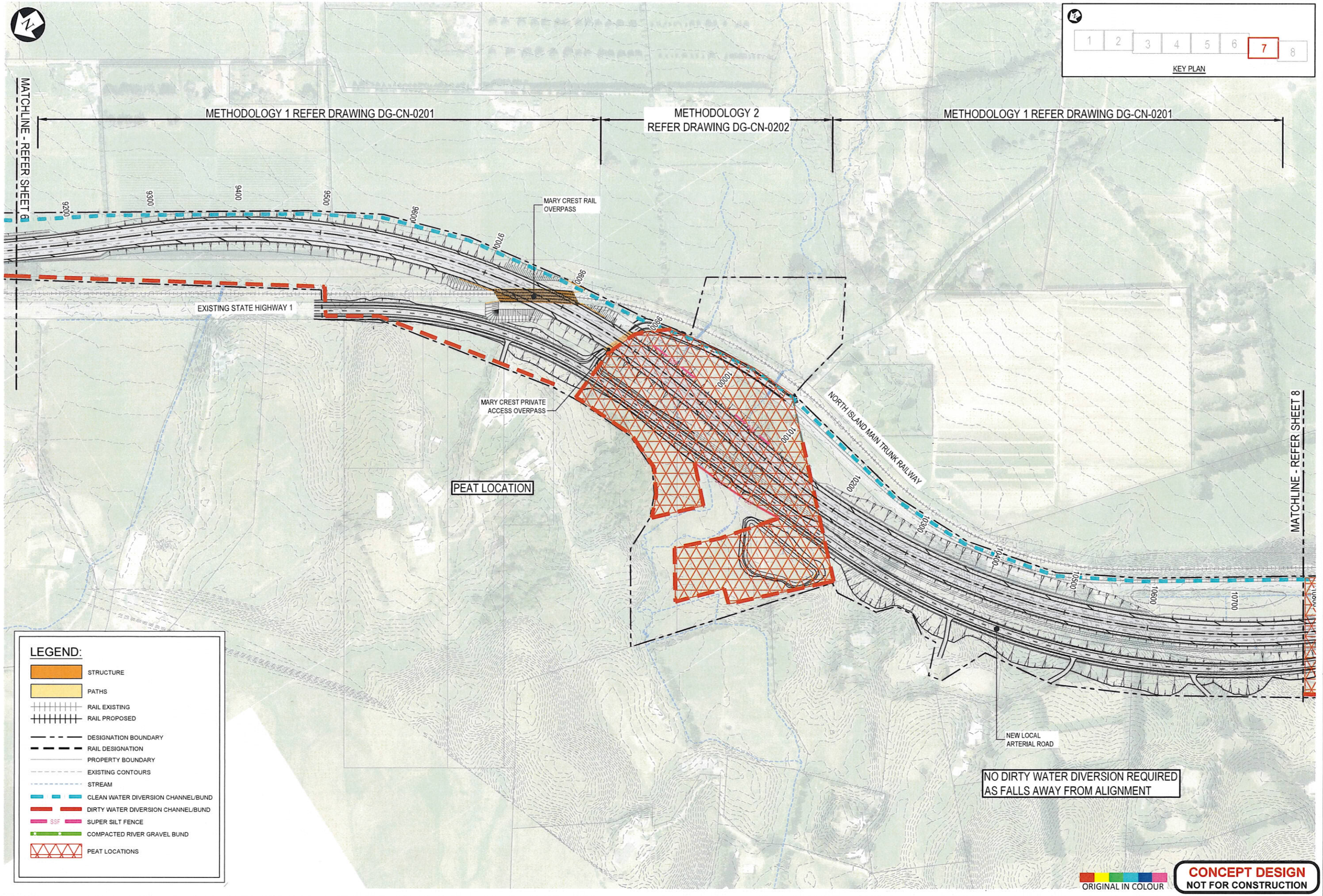

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Subject: EROSION AND SEDIMENT CONTROL
Title: CONCEPTUAL PLAN SHEET 7 OF 8

Discipline: CONSTRUCTION
Drawing No.: DG-CN-0107
Rev.: A

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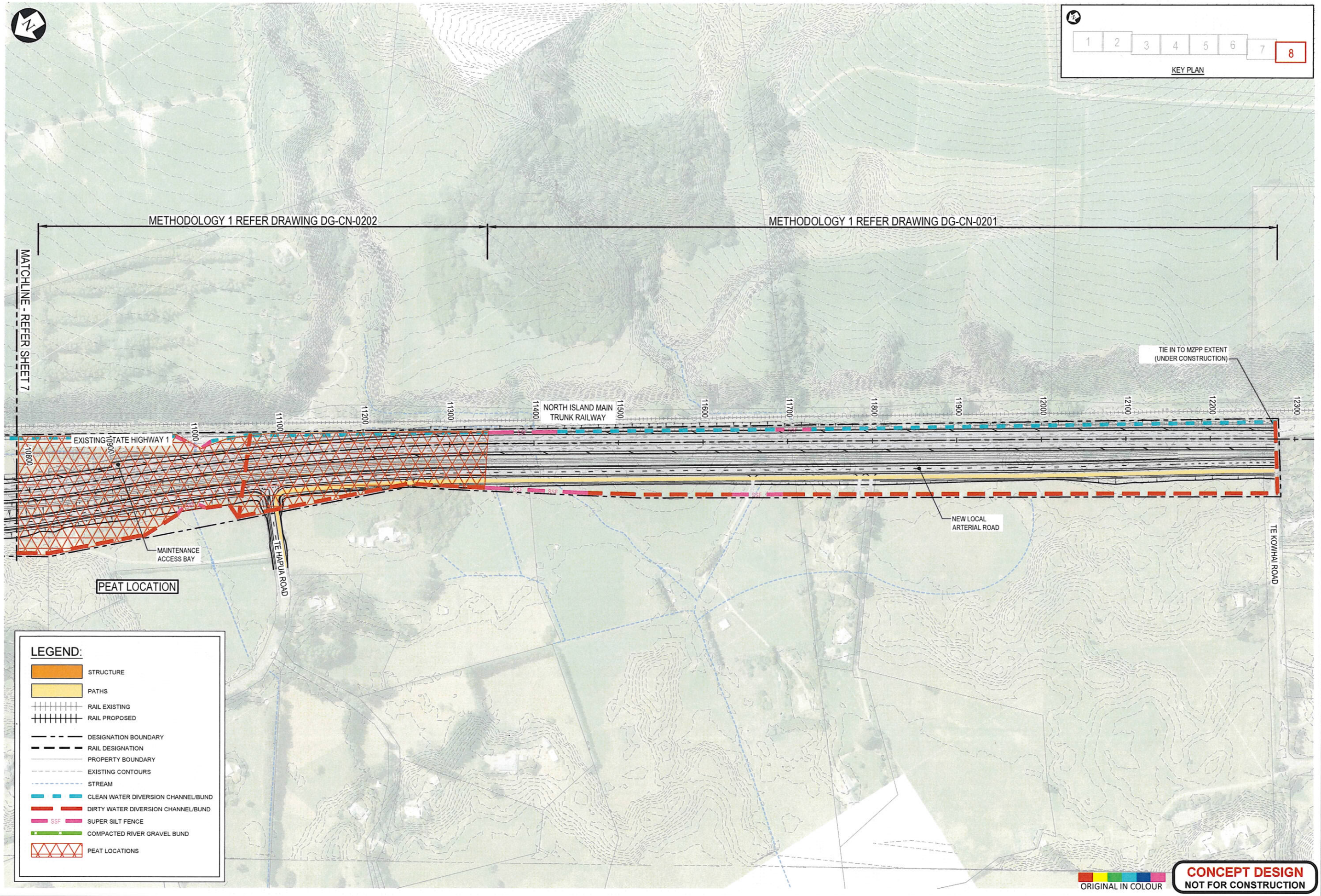

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NZ TRANSPORT AGENCY WAKA KOTAHI

PEKA PEKA TO ŌTAKI EXPRESSWAY

Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: EROSION AND SEDIMENT CONTROL
Title: CONCEPTUAL PLAN SHEET 8 OF 8

Discipline: CONSTRUCTION
Drawing No.: DG-CN-0108
Rev.: A

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APPENDIX G: FULL CONDITIONS E.4 AND G.42

E.4	a) In the event of either a failure of erosion and sediment control devices or where a storm event exceeds the design volume of the device, and where the discharge is to a perennial or intermittent fresh Water Body, a suitably qualified ecologist shall be notified within 24 hours, who shall then inspect the relevant area to determine whether there has been a significant adverse effect on the affected area's ecological values. b) The consent holder shall prepare a report on the effects of the failure and any recommended measures that may be required to remedy the effects. The report shall be submitted to the Manager for approval within 5 Working Days of the event. c) The consent holder shall ensure that after reasonable mixing no further serious impacts shall occur within the receiving environment. d) The remedial measures shall be implemented within 10 Working Days of the approval of the Manager.

G.42	The construction turbidity monitoring set out in Condition G.41a) shall use the turbidity triggers set in the EMP (using the process set out in the EMP and Condition G.39. During construction, until the relevant earthwork area discharging to the monitored waterways is stabilised, should the gross exceedance trigger be exceeded in any of the three required monitoring events following an exceedance of the rainfall trigger, or the elevated level trigger be exceeded at the 48 hour monitoring, the following responses shall be implemented by the consent holder a) Within 24 hours of the trigger breach carry out and record in writing a full audit of the condition of all erosion and sediment control measures within the earthworks area discharging to the monitored waterway; b) Remedy any causes on site that may have contributed to the trigger breach as soon as practicable, and record what remedial measures were undertaken; c) Notify the Manager within 1 Working Day of the trigger breach, including providing details of the percentage change in turbidity and any remedial measures taken; d) If the NTU threshold remains generally elevated above the trigger for more than 48hrs, then macro-invertebrate sampling shall be undertaken following Protocols C1 or C2, as set out in Protocols for Sampling Macro-invertebrates in Wadeable Streams, MfE 2001

	(for hard and soft-bottomed streams, respectively) within 2 Working Days at upstream and downstream sites agreed to by the Manager (known discharge points shall be specified in the EMP). All laboratory analysis of these samples shall include a full macro-invertebrate count; e) Within 10 Working Days of the collection of the macro-invertebrate samples, a report shall be provided to the Manager which has been prepared by a suitably qualified and experienced aquatic ecologist, and which includes the following: i) The results of the macro-invertebrate sampling; ii) The causes of the discharge, the response to remedy the cause and measures proposed to avoid a recurrence of this cause; and iii) An assessment undertaken by a suitably qualified and experienced aquatic ecologist which details whether the following thresholds have been exceeded: a) A decline in the Quantitative Macro-invertebrate Community Index (QMCI) score of 1.5 or greater from the corresponding upstream monitoring site or baseline monitoring scores; or b) A decline of greater than 20% in sensitive invertebrate taxa (in this case taxa with a QMCI score of ≥ 5) compared to the upstream monitoring site or baseline monitoring scores; and f) If the levels in e)iii) are exceeded, mitigation measures shall be undertaken, in accordance with the adaptive management process outlined in the EMP. As part of the report required above the consent holder shall, in consultation with the Manager, detail what mitigation measures are proposed and the timeframes for implementing these. The consent holder shall implement the mitigation measures approved by the Manager. These measures shall be implemented to the Manager's satisfaction and within the timeframe specified by the Manager.